

⑩日本国特許庁
公開特許公報

⑪特許出願公開
昭53—138387

⑫Int. Cl. ² G 01 N 21/32 B 23 K 31/00 G 01 N 33/20	識別記号 112 H 02 12 B 10 113 E 2	⑬日本分類 7145—23 6527—39 7363—23	⑭内整理番号 厅内整理番号 7145—23 6527—39 7363—23	⑮公開 昭和53年(1978)12月2日
				発明の数 1 審査請求 未請求

(全 3 頁)

⑯溶接部材の検査方法

⑰特 願 昭52—52565

⑱出 願 昭52(1977)5月10日

⑲發明者 高橋忍

横須賀市船越町1の201の1

東京芝浦電気株式会社横須賀工
場内

⑳發明者 青野弘之

横須賀市船越町1の201の1
東京芝浦電気株式会社横須賀工
場内

㉑出願人 東京芝浦電気株式会社

川崎市幸区堀川町72番地

㉒代理 人 弁理士 井上一男

明 誌 書

1. 発明の名称

溶接部材の検査方法

2. 特許請求の範囲

導光体を介して検査光を溶接部材に放射し、その通過光または反射光を導光体を介して受光器に受けて、その光量を電気信号に変換し、この電気信号を基準値と比較することによって溶接部材の溶接の良否を判定することを特徴とする溶接部材の検査方法。

3. 発明の詳細な説明

本発明は溶接部材の検査方法に關し、特に導入線など小物の交合わせ溶接された部材の検査に好適な方法である。

導入線などの溶接部材はガス溶接、アーク溶接、抵抗溶接などの手段によつて溶接され、溶接部の形状も種々異つてゐる。

そして、従来の溶接部材の検査方法は溶接条件の良否から溶接の良否を判定するのが普通であつた。たとえば、導入線のアーク溶接においては、

才1 図示のように、被溶接部材(1)、(2)に電極(3)を設置して溶接する場合。

(a) 電極(3)と一方の被溶接部材(1)との間に電流検知電極(4)を介して溶接電流を検知する。

(b) 兩被溶接部材(1)、(2)間に電圧検知素子(5)を設けて、溶接電圧を検知する。

(c) (a)と同様を手放で溶接開始時点を知り、また(b)と同様を手放で溶接終了時点を知り、これから溶接時間を電気信号の形で検知する。

そして、このようにして検知した測定値は、才2 図示のように、増幅して基準値と比較して良否を判定する。

このような従来の検査方法はあくまでも間接的な手段で、たとえば形状不良などは検知できない欠点がある。さりとて、溶接後において肉眼検査したのでは導入線製造などのように自動的に連続生産する場合、時間的遅れのため大量の不良を発生するおそれがある。

本発明はこのような従来技術の欠点を除くためになされたもので、溶接質量において光学的手段

によつて直接的に検査し、これによつて形状からびに外観の不良を適格に判定できる検査方法を提供することである。

以下、本発明の詳細を方3・図示の実施例によつて説明する。

図は本発明を半導体用導入線の検査に適用したもので、図中、00は磨盤直後の磨耗物の一例である導入線、01はその接続部、(12a)(12b)はこの接続部01に対し90度離てπ角度から対向するオブチカルファイバなどのオ1の導光体。(13a)(13b)はこれら導光体(12a)、(12b)の基端に設けられた検査用光源無極、(14a)(14b)は上記磨耗部01の反対側において上記オ1の導光体(12a)(12b)に對向するオ2の導光体、(15a)(15b)はこれらオ2の導光体(14a)(14b)の基端に設けられ内部に光電変換素子を収容した受光器である。

丙先導装置(13a)(13b)を作動させると、その光はオ1の導光体(12a)(12b)

を通りて磨盤部01の近傍に導かれ、ここから検査光が磨盤部01に向つて投射され、磨盤部01の周囲を通過した光がオ2の導光体(14a)(14b)に入射して受光器(15a)(15b)に導かれ、光電変換素子は受光器に応じた電気信号を発する。

このようして、両受光器(15a)(15b)から発せられた電気信号はタイマと内ゲートとの作用によつて同じ時点においてそれぞれの増幅器に導かれてここで増幅され、ついでそれぞれ基準値と比較されて、両比較値とも良品限界にあれば良品として判定される。

そして、方5図示のように、一方の導光体(12a)から投射された検査光は導入線00の磨盤部01の周辺を通りてオ2の導光体(14a)に入射し、磨盤部01の影を生じる。したがつて、オ2の導光体(14a)に入射する光量は磨盤部01の断面積に關係する。いま、方5図示のように、磨盤部01にはり印が形成されていると、検査光ははり印によつてもさえぎられ、オ2の導光体(14a)に入射する光量はそれだけ減少するこ

となる。そこで、良品である導入線00を検査したときの増幅器出力を予め測定して、基準値をこれに合わせておけば、許容限界以上のはり印があれば不良と判定されるわけである。

しかし、方3図および方4図示のようなく、90度離てπ角度から同時に測定すれば、磨盤部01のどの部分にはり印が存在しても検知して判定できるわけである。

なお、本発明においては方6図示のようにオ1およびオ2の導光体(12a)(14a)を導入線00の磨盤部01の同じ側に設けて、オ1の導光体(12a)から投射して磨盤部01から反射されん検査光をオ2の導光体(14a)に受けるようにしてもよく、この場合はり印などから検査光が反射されれば反射光量が増えるので、増幅器出力は大きくなり、やはり基準値からの偏差が大きくなつて不良と判定される。

そして、本発明方法によれば、内観検査ではないので、磨盤に際して免ぜられる閃光によつて眩惑されることなく、また、タイマが設けられ

ているので上記閃光によつて測定が狂うこともない。さらに検査光はオ1の導光体(12a)(12b)によつて磨盤部01近傍まで導かれてここから投射され、また検査光は磨盤部01近傍に設けられたオ2の導光体(14a)(14b)に受光されるので、外部光によつて測定が狂わされることなく、さらに測定および判定がしん簡的に行えるので、磨盤直後において検査することが可能で、このため、不良が発生しても直に対処して不良の大量発生を防止でき、さらに複雑な磨盤装置の各部分にじやまされることなく近接測定ができる利点もある。

なお、前述の各実施例においては導光体は検査光を投射する導光体と、検査光を受ける導光体とを別体に設けたが、本発明においては1個の導光体を検査光投射用と受光用とに兼用してもよい。そして、導光体はオブチカルファイバのよう不可視性を有するものでも、合成樹脂棒のよう不可視性のないものでもどちらでもよい。

そして、本発明万能で検査できる不良項目は、

前述の通りのほか、倍率の過不足も検査可能で、さらに本装置を複数個用いることによって元とえば導入線の接続確認も検査できる。さらに、検査対象となる接続部材は前述の導入線に限らないが、一般的に、小物で連続生産される接続部材の検査に効果がある。

このように、本発明の接続部材の検査方法は、導光体を介して検査光を接続部材に投射し、その通過光または反射光を導光体を介して受光器に受け、その受光量に応じた電気信号に変換し、その値を基準値と比較することによって接続部材の接続の良否を判定するので、接続の閃光や外露光によつて妨害されるととなく、接続直後でも検査でき、検査がしゅん間的であるので、特に小物の大連続生産に好適である。

4. 図面の簡単な説明

オ1図は従来の接続部材の検査方法の一例を説明する説明図、オ2図は同じく検査回路のブロック図、オ3図は本発明の接続部材の検査方法の一実施例を説明する説明図、オ4図は同じく検査回

特許第53-138387回
路のブロック図、オ5図は同じく検査原理を示す要部拡大説明図、オ6図は他の実施例の検査原理を示す要部拡大説明図である。

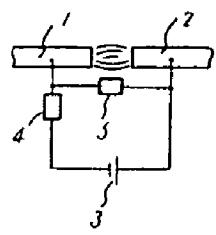
(1)…接続部材。

(12a)(12b)(14a)(14b)…導光体。

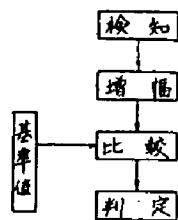
(15a)(15b)…受光器。

代理人弁理士井上一男

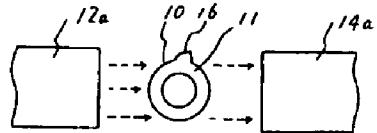
第1図



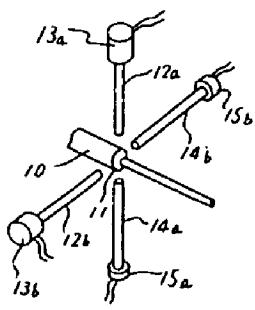
第2図



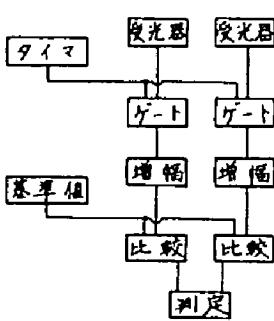
第5図



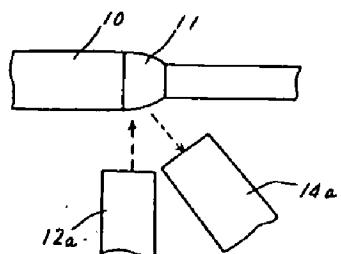
第3図



第4図



第6図



1. The title of the invention: Inspecting method of welding members

2. Claim

A method of inspection for welding members, characterised by projecting a inspecting light beam through a light guide to the welding members, receiving by a photo detector a transmitted light or a reflected light from said welding member through another light guide, converting the quantity of the light received by said photo detector to electrical signal and comparing the magnitude of the electrical signal with a referece signal whereby the goodness or not of welding can be judged.

3. Detailed description of the invention

The present invention relates to a method of the inspection of welding members, and more particularly, to a most suitable inspection method of welding members with smaller size, such as lead-in wires, in the butt-welding.

The welding members such as lead-in wires may be welded by means of gas welding, arc welding, resistive welding and so on. The shape of the welding portion are variously varied.

According to traditional inspecting methods of the welding mambers, goodness or not of welding is usually

judged from the welding conditions. In the case of the arc welding of lead-in wires, for example, the welding members 1 and 2 are each connected to a electrical power supply 3 and welding is carried out, wherein

- (a) Welding current is detected by using a current detecting element 4 which is connected between the electrical power supply 3 and one member 1 of welding,
- (b) Welding voltage is detected by using a voltage detecting element 5 which is connected between the welding members 1 and 2,
- (c) The start time of the welding is detected using the same means as (a) and the finish time of the welding is detected using the same means as (b), from which the welding time interval is known as a form of electrical signal.

Next, as shown in Figure 2, signals obtained from such detections are amplified and compared with a referece value. From these comparisions, the goodness or not of the welding is judged.

Such traditional methods are rather indirect methods and may have several faults. For example, such methods can not detect badness of the shape of the welding portion. But, if the inspection of the shape of the welding portion is visually carried out in the automatic and continuous production process of lesd-in wires, it is afraid that large amount of bad products might be manufactured due to the time lag between a stream of the welding members in the continuous production and the detections.

An object of the present invention is to remove such faults that the traditional methods have. According to the present invention, a novel method is provided that the welding portion inside the welding machine is directly and optically inspected and the goodness or not of the shape and the external appearance of the welding portion are judged accurately. Details of the present invention will be described in the followings.

Figure 3 illustrates an embodiment of the inventive method applied to the inspection of the lead-in wires for semiconductors. In Figure 3, 10 is a lead-in wire which is for example a welding member immediately after welding, 11 is a welding portion thereof, 12a and 12b are first light guides such as optical fibers in which these two guides are disposed in the two directions separated by 90° and pointed to the welding portion 11, 13a and 13b are light sources mounted at the base ends of the light guides 12a and 12b respectively, 14a and 14b are second light guides which are same as the first light guides 12a and 12b respectively but disposed in the opposite side of the welding portion 11, 15a and 15b are photo detectors which are mounted at the base ends of the second light guides 14a and 14b respectively wherein each has a photoelectric conversion element therein.

When both light sources 13a and 13b are activated, the light beams are generated from these light sources and are transmitted through the first light guides 12a and 12b and illuminate the welding portion 11 as

inspecting light beams. A part of these inspecting light beams are intercepted by the welding portion 11, but some part of them pass around the welding portion 11 and are entered into the second light guides 14a and 14b and further transmitted to the photo detectors 15a and 15b. The photoelectric converters in the photo detectors 15a and 15b generate electrical signals. The magnitudes of the electrical signals depend on the quantity of received light.

The electrical signals generated by both photo detectors 15a and 15b are then sent to the respective amplifier. By the fact that both gates are activated by a timer, these signals are reached at respective amplifier at the same time, and are amplified. These signals are then compared with a reference signal. If the values obtained from these comparisions are less than a certain limit, it will be judged as good welding.

As shown in Figure 5, a part of the inspecting light beam which is projected from the first guide 12a pass around the outside of the welding portion 11 and is entered into the second light guide 14a, and on the end plane of the second light guide 14a a shadow of the welding portion 11 is formed. Therefore, a quantity of the light entered into the second light guide 14a vary with the cross sectional area of the welding portion 11. If a burr 16 is formed on the surface of the welding portion 11 as shown in Figure 5, a part of the inspecting light is also intercepted by the burr 16, and the quantity of the light entered into the second light

guide 14a is further reduced due to this interception. So, a beforehand inspection for a lead-in wire having good welding portion can be practiced in advance, and if the value of output of the amplifier at that time is taken as a reference value, we can judge whether burr 16 beyond the allowance limit exist or not.

Hence, when the inspection is performed simultaneously using two light guides disposed in the two directions separated by 90° as shown in Figure 3 and Figure 4, we can detect burrs 16 at any location on the surface of the welding portion 11 and can judge the allaround goodness or not of the welding.

Also, according to the present invention, as shown in Figure 6, the first light guide 12a and the second light guide 14a can be disposed in the same side of the welding portion 11 of the lead-in wire 10. In this case, a part of the light beam projected from the first light guide 12a is reflected at the welding portion 11 and this reflected light beam may enter into the second light guide 14a. If such reflected light beam comes from the bars and the like, amount of the reflected light will increase and its deviation from a reference value also increase, whereby we can judge the goodness or not of welding of this portion.

As the method according to the present invention is not a visual one using naked eyes, this inspection will not be influenced by dazzle due to the flashlight generated by welding, and as the timer is also used, the measurement in this inspection will not happen to go

wrong even such dazzle occurs. Moreover, since the inspecting lights are guided to the location in close proximity of the welding portion 11 and projected thereto and received by the second light guide 14a and 14b disposed at close proximity of the welding portion 11, the measurement in this inspection will not be influenced by the external light. Also, as the measurement and the judgement in this inspection finish momentarily, the inspection immediately after the welding is possible. If even no good weldings are happen to form, we can immedeately find them and can prevent large amount of production of no good weldings.

Moreover, the method according to the present invention has also an advantage that the measurement at the location in close proximity of the welding portion is possible in spite of the inspection using such a complex welding machine.

In the embodiments descreibed above, the light guide which projects light beam and the light guide which receives light beam are separated light guides, however,in the present invention, single light guide can be used as both projecting and receiving light guide. Further, the light guide may be a flexible one such as a optical fiber and may also be a nonflexible one such as a rod of plastics.

Items which can be inspected by the method according to the present invention are not only said burrs, but also excess and deficiency of melting in the welding. Moreover, the bending of the lead-in wire can

also be inspected by using a plural of inspection machines according to the present invention. Further, the welding members inspected are not limited to the lead-in wire, but generally speaking, it is most preferable to inspect the welding members which have small size and are in the process of continuous production.

Thus, as is described above, the inspecting method of the welding members according to the present invention comprises projecting the inspecting light beam through a light guide to the welding members, receiving the transmitted light beam or the reflected light beam through another light guide by the photo detector, converting the quantities of light received by the photo detector to the electrical signals and comparing the magnitude of the electrical signals with a reference value, whereby the goodness or not of the welding can be judged. The inspecting method according to the present invention is not influenced from the flashlight in welding and the external light, and can be carried out even immediately after the welding. This method is most preferable applied to the inspection of the welding members with small size and in the process of continuous production.

4. Brief description of the drawings

Figure 1 is a drawing which explains an example of a traditional method for inspection of the welding members.

Figure 2 is a block diagram of the inspection circuit of Figure 1.

Figure 3 is a drawing which explains an embodiment of the method of the welding members according to the present invention.

Figure 4 is a block diagram of the inspectin circut of Figure 3.

Figure 5 is an enlarged drawing of the important part of an embodiment which shows a priciple of the inspecting method according to the present invention.

Figure 6 is another enlarged drawing of the important part of another embodiment which shows another principle of the inspecting method according to the present invention.

Description of the reference number

12a, 12b, 14a, 14b light guide

15a, 15b photo detector

前述のばかりのほか、感度の過不足も検査可能で、さらに本装置を複数個用いることによってたとえば導入線の接続曲りも検査できる。さらに、検査対象となる溶接部材は前述の導入線に限らないが、一般的に、小物で連続生産される溶接部材の検査に著効がある。

このようすに、本発明の溶接部材の検査方法は、導光体を介して検査光を溶接部材に投射し、その通過光または反射光を導光体を介して受光器に受け、その受光量に応じた電気信号に変換し、その値を基準値と比較することによって溶接部材の溶接の良否を判定するので、溶接の閃光や外部光によつて妨害されることなく、溶接直後でも検査でき、検査がしゅん簡的であるので、特に小物の大連続生産に好適である。

4. 図面の簡単な説明

第1図は従来の溶接部材の検査方法の一例を説明する説明図、第2図は同じく検査回路のブロック図、第3図は本発明の溶接部材の検査方法の一実施例を説明する説明図、第4図は同じく検査回

特開昭53-138387(3)
路のブロック図、第5図は同じく検査原理を示す要部拡大説明図、第6図は他の実施例の検査原理を示す要部拡大説明図である。

(1) ... 溶接部材。

(12a)(12b)(14a)(14b) ... 導光体。

(15a)(15b) ... 受光器。

代理人弁理士井上一男

